Patients increasingly demand dental restorations with optimal esthetics that match their physical appearance. The evolution of restorative materials and bonding procedures combined with contemporary laboratory techniques have led to more conservative alternatives to crowns for optimizing a smile. These procedures include direct composite resins, orthodontics, conventional veneers, and minimum thickness ceramic veneers. Minimal tooth structure removal is an essential component of contemporary treatment. A conservative approach, such as minimal thickness ceramic veneers, may provide satisfactory esthetic results and also present excellent longevity when the veneers are bonded to enamel. However, a systematic analysis is needed for a successful esthetic outcome.

Diagnostic waxing is recommended to increase predictability and evaluate tooth proportions, alignment, texture, and incisal angles. The dental laboratory technician bases the diagnostic waxing on established tooth proportion guidelines, information provided by the dentist, and photographs. The waxing can also be used to generate trial restorations. Recently, the dental smile design concept has been introduced as an aid to planning esthetic treatments. The transfer of information from the digital design to the dental laboratory to produce the restoration has proven to be effective. Other dental smile design variations and digital techniques have been developed to improve the predictability of esthetic treatments.

With the introduction of intraoral scanning and advances in software, 3-dimensional (3D) intraoral scanning rather than 2D digital photographs can now be used to design esthetic treatment. The facial aspects of the patient are considered and viewed when the virtual teeth are designed. This procedure can produce a design that closely represents the definitive smile for patient evaluation and trial restoration. Subsequently, the intraoral scanner is also used to make the digital impression of the prepared teeth, to process the restorations in a computer-aided design and computer-aided manufacturing (CAD-CAM) system, and to allow a complete digital workflow.

This clinical report describes conservative esthetic rehabilitation planned with a tool (RealView Engine; 3Shape) available with intraoral scanner software (Dental System; 3Shape). A 3D design was aligned over a
photograph of the patient to produce an immediate virtual smile for trial restorations and ceramic veneers.

**CLINICAL REPORT**

A patient complained of white stains, dullness, and disharmonic forms of the anterior teeth. At the first appointment, a series of intraoral and facial photographs were made (Fig. 1A, B), and the patient’s arches were scanned (Fig. 1C) (Trios Color; 3Shape).

The smile design was developed using software (3Shape Dental System). Initially, the 4 incisors were virtually extracted from the 3D scan. A frontal picture of the patient with a wide smile was then brought to the screen. The initial step (Fig. 2A) involved selecting the cropping tool that trimmed the area where the scan would be seen over the photograph. The scan was aligned with the photograph by using blue bullet points as matching references that were placed on the photograph and scanned simultaneously. A black outline became visible that contoured the scan, overlapping the photograph with reduced opacity (Fig. 2B). The final design was concluded using vertical and horizontal lines, following the basic concepts of proportions and symmetry (Fig. 2C, D). At this point, the patient was asked to approve the design of her smile. The final 3D design was printed (Eden 500; Stratasys) to make trial restorations.

Clinical procedures began with gingivoplasty around the central incisors and second premolars. After tissue healing, the trial restoration was fabricated using a polyvinyl siloxane impression material (Virtual; Ivoclar Vivadent AG) over the printed model and then placed over the teeth using bis-acrylic resin (Systemp C&B II A1; Ivoclar Vivadent AG). The enamel of the incisors and canines (Fig. 3A) was minimally prepared, and the preparations (Fig. 3B), trial restoration, and antagonist arch were scanned and subsequently morphed to create the veneers. The veneers were then sent to be milled (Ceramill Motion 2; Amann Girrbach) from leucite-reinforced glass-ceramic (Empress CAD Multi B1; Ivoclar Vivadent AG). They were cemented with a light-polymerizing resin cement (Variolink Veneer; Ivoclar Vivadent AG), resulting in satisfactory esthetic outcome (Fig. 4).

**DISCUSSION**

This report describes how a digital plan contributed to the achievement of a satisfactory and predictable esthetic outcome. A precise diagnosis and a comprehensive plan that considers facial and dentogingival individual aspects should be mandatory to predict the result of any oral treatment, especially when esthetics are involved.

Planning for esthetically demanding patients has evolved from diagnostic gypsum casts mounted on semiadjustable articulators and then waxed to a virtual design made over a digital photograph with the assistance of lines and rulers. The digital plan facilitated the quality of the communication among the clinician, the patient, and the laboratory technician, resulting in predictability and possibly increased treatment acceptance. Following the digital design, a conventional wax pattern is usually made over a diagnostic cast, using the parameters defined in the virtual design. This pattern
may be replicated in the mouth by using the trial restoration, providing the patient with an excellent approximation of the definitive result.\(^7\)\(^\text{-}\)\(^1\)\(^1\,\text{19,20}\)

An appropriate wax pattern depends on adequate impression and pouring and also on the ability of the technician to follow the virtual guideline. With the advances in dental technology, including intraoral scanners and CAD-CAM systems, a complete digital flow can be created in restorative treatments, from planning to production. The planning technique described in this report eliminates the need for impressions, pouring, and waxing and can be processed entirely by the dentist. It

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**Figure 2.** A, Blue bullet points for matching references placed on incisal edges of teeth of photograph and their positions in 3D virtual design. B, Virtual 3D design being transferred to digital photograph. C, Initial step from RealView Engine. Smile photograph side by side with 3D virtual design reconstructed with virtual teeth from library. Shade selection recording (note red box in left central of photograph). D, Interpupillary line being used to set final RealViews result to be presented to patient.

**Figure 3.** A, Conservatively prepared teeth for minimal thickness ceramic veneers of 6 anterior teeth. Note that preparation restricted to enamel and presented visible finishing margins for scanning and software design purposes. B, Result of digital impression using intraoral scanning.
Conservative esthetic solutions have been developed based on concepts of adhesive dentistry. One of the most popular esthetic approaches is the use of ceramic veneers, which combine excellent optical properties, texture, and strength of the material with reduced tooth preparation. Reinforced translucent glass ceramics currently allow minimal tooth preparation, resulting in veneers with thicknesses ranging between 0.2 and 0.5 mm. In addition to tooth preservation, it permits adhesion to enamel, resulting in increased clinical longevity. However, minimal thickness veneers are contraindicated for the correction of discolored teeth, diastema closure of triangular-shaped teeth, and teeth with bulky facial surfaces and patients with parafunctional habits. The reduced thickness of such veneers makes them more susceptible to fracture, so combining reinforced glass ceramics with the preparation of enamel surfaces is essential. The use of minimal thickness ceramic veneers is promising, but more long-term clinical studies are needed.

SUMMARY

By using the presented digital plan through the RealView Engine, this clinical report demonstrated an effective and predictable workflow, resulting in an adequate and conservative esthetic outcome.

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Corresponding author:
Dr Nelson R. F. A. Silva
Federal University of Minas Gerais (UFMG)
Department of Restorative Dentistry
Dental School, Room 3301
Av Antônio Carlos 6627
Belo Horizonte, MG, 31270-901
BRAZIL
Email: nrfa.silva@gmail.com

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